Implementation of an Object-Oriented Low Back Pain Guideline

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We have implemented an electronic version of the AHCPR Acute Low Back Problems in Adults Clinical Practice Guideline [1] using an object-oriented guideline implementation tool. Our goal is to provide both a stand-alone World Wide Web (WWW) interface as well as to make the system easily integratable to an Electronic Medical Record (EMR) System. In doing so, we have had to address a number of problems related to the design of the guideline which impacted not only on the design of our implementation, but also on our desire to integrate the system to an EMR.

To construct the guideline implementation, we used the locally developed MBTA (Modeling Better Treatment Advice) guideline development system [2]. MBTA requires that the data both used and produced by the guideline logic be encapsulated into a number of frame-like objects. That is, the system takes a set of 'input objects' containing the clinical data and creates a set of 'output objects' containing structured guideline results. These output objects are then processed in a separate step to produce an explanation, which is returned to the clinician either via the EMR or via a web page. In our current low back pain implementation, the clinician enters data into a web-based form which is then converted to a set of input objects. The guideline logic then creates the output objects, which are converted to hypertext advice regarding diagnostic considerations and management.

The architecture of MBTA requires that the input and output objects be well-defined prior to designing the guideline logic. We found that this design process helped clarify some of the logical inconsistencies within the guideline itself, as well as those guideline parameters which needed more clarification. We encapsulated these poorly clarified parameters within a single input object. By doing this we hope to improve the portability and customization of the guideline implementation without requiring changes to the guideline logic.

We started our guideline implementation by studying the AHCPR back pain guideline to determine all the data items required for guideline execution and from this we created a set of input objects. We modeled these objects to closely resemble the organization of a history and physical examination. The vocabulary used in the guideline was compared with standard medical vocabularies such as MeSH, SNOMED and ICD9, and terms were modified where they could match a standard vocabulary without a change in meaning. A logic module was then created to process the input objects according to the guideline rules, and to produce a set of output objects. These output objects are used by an explanation component which converts the output objects into textual advice for the clinician.

Several problems were encountered in the process of implementing this guideline. First, the AHCPR guideline was internally inconsistent in a number of areas, including the age above which one should worry about a spinal fracture, the definition of bladder dysfunction, and the role of spinal stenosis and ankylosing spondylitis. Second, the guideline did not specify what should happen in the case of missing or unknown information. Third, the guideline made reference to the need to exclude non-spinal causes of low back pain, but did not specify how to do so. We had to decide what non-spinal causes to use, as well as suggestions for management. These issues were resolved by creating some customizable objects as discussed above and by consulting with a number of local experts. Unfortunately, the local modifications decreased the portability of the guideline implementation.

References

[1]   Agency for Health Care Policy and Research. *Acute Low Back Problems in Adults*. U.S. Department of Health and Human Services, 1994.

[2]   Barnes, MR, Barnett GO. An Architecture for a Distributed Guideline Server. In Gardner RM, ed. *Proceedings of the Nineteenth Annual Symposium on Computer Applications in Medical Care*. pages 233-237, 1995.